

GLADESVILLE BRIDGE

Fifty Years
ANNIVERSARY
C O M M E M O R A T I V E B O O K L E T



FOREWORD



I feel very privileged to be invited to write the foreword to this commemorative booklet: needless to say, Gladesville holds a very special place in my life. The circumstances which led to a raw graduate

being responsible for the detailed design of a record breaking bridge seemed unexceptional at the time and it didn't really sink in until later just how fortunate I had been.

My boss Guy Maunsell had returned from Australia with his concept for a big concrete arch and needed someone to work with him on the realisation of his dream. It had to be done as inexpensively as possible because it was viewed as somewhat of a long shot and the recent graduate recruit was the obvious choice! It was only after the design was finished that I realised what an incredible opportunity it had been.

I am sometimes asked how bridge design then differed from now. Two words – codes and computers. Design specifications were very

basic; from memory the Department of Main Roads bridge code ran to about 40 pages and the UK one was only slightly longer. The current version of the US bridge design specification contains 1,638 pages. We had to design almost everything from first principles and since several aspects of the design were not addressed in any of the specifications, this allowed us a latitude not available today.

Although a limited number of main frame computers existed, there were no commercially available engineering programmes so we had to write our own. The potential benefits of computerisation outweighed the effort of learning basic programming and ultimately all aspects of the analysis and detailing of the arch were executed using application programmes specially written for the purpose.

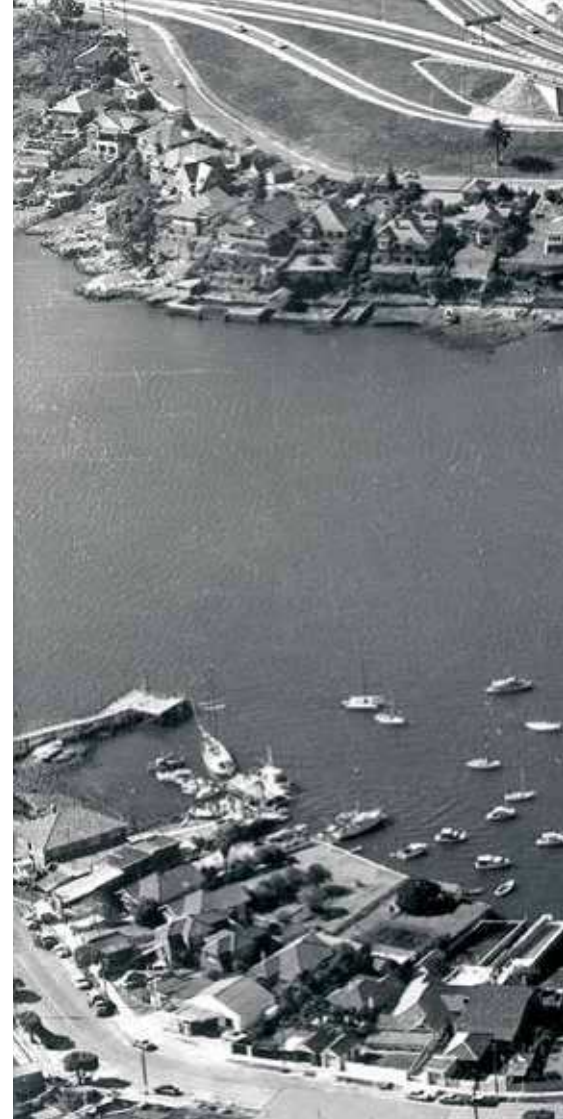
The people of Sydney should be extremely proud that they live in the only city in the world where a bridge like Gladesville could be overshadowed by – or at least have to share the limelight with – two other iconic structures. It was and still is by any standards a great bridge, not only because

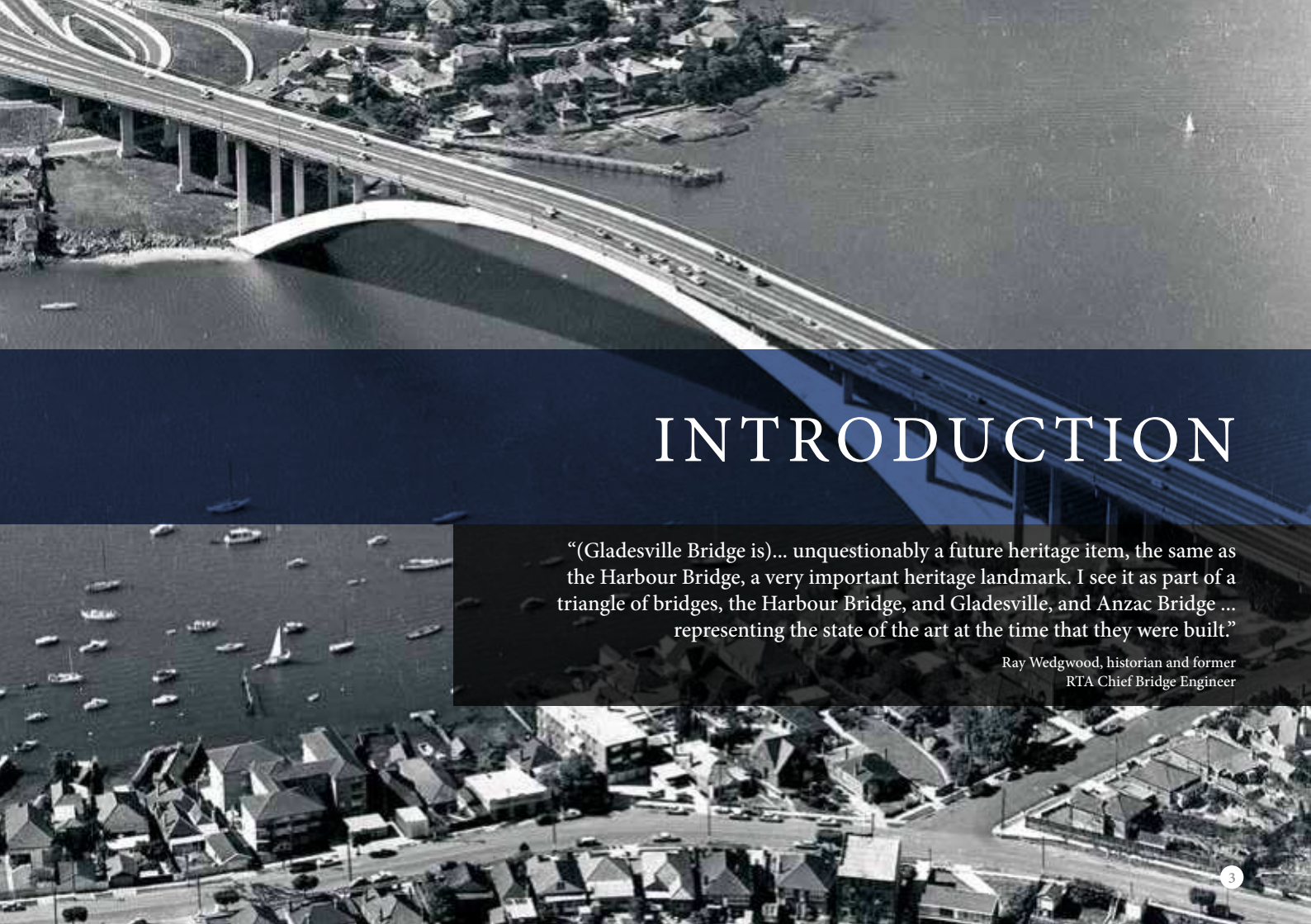
of its record breaking span – and there have only been 6 larger concrete arches built in the intervening 50 years – but because it featured a number of design innovations which have since been widely adopted. It is greatly to the credit of the former Department of Main Roads that they had the courage, open-mindedness and generosity to accept an alternative design which stretched the boundaries to such an extent that it gave them plenty of cause to reject it had they been so inclined.

It is extremely gratifying to see this 50 year anniversary receiving well-merited attention. It is also a sobering reminder of the passage of time! However, Gladesville is so soundly constructed and in such good condition that I see no reason why it should not remain functional for another 50 years and I look forward to gazing down in 2064 on our descendants celebrating the centenary of one of the world's great bridges.

Tony Gee

Designer of the Gladesville Bridge





INTRODUCTION

“(Gladesville Bridge is)... unquestionably a future heritage item, the same as the Harbour Bridge, a very important heritage landmark. I see it as part of a triangle of bridges, the Harbour Bridge, and Gladesville, and Anzac Bridge ... representing the state of the art at the time that they were built.”

Ray Wedgwood, historian and former
RTA Chief Bridge Engineer

“We were building roads in the sky.”

Ray Wedgwood, historian and former RTA Chief Bridge Engineer

On 1 October 2014 the NSW Government celebrates the 50 year anniversary of the opening of the Gladesville Bridge and the recognition of the bridge as an Engineering Heritage International Marker by Engineers Australia.

Gladesville Bridge takes vehicle and pedestrian traffic between Gladesville and Drummoyne over the Parramatta River and is located six kilometres north west of Sydney's Central Business District.

When opened on 2 October 1964 Gladesville Bridge was, at 1000 feet (305 metres), the longest span concrete arch bridge in the world. It remained so until superseded in 1980 by the 416 metre span Krk Bridge in Croatia.

Its design features, innovative construction methods and jacking process set new standards for bridge design and construction. The bridge was in part responsible for the rapid growth in the number of specialist bridge design consultancies in Australia.

Built roughly 30 years apart, Sydney Harbour Bridge, Gladesville Bridge and Anzac Bridge represent state of the art bridge design for their eras. Gladesville Bridge was the first major concrete arch bridge in the world that was built using precast sections. It marked the transition

from steel bridge technology as represented by Sydney Harbour Bridge towards concrete design, and was one of the first bridges designed with the aid of a computer. In later years the cable-stayed Anzac Bridge would mark the emergence of yet another bridge technology in Australia.

In 1965 Gladesville Bridge was awarded a Civic Design Award by the Royal Australian Institute of Architects.

On 1 October 2014 Gladesville Bridge was listed on the NSW State Heritage Register.

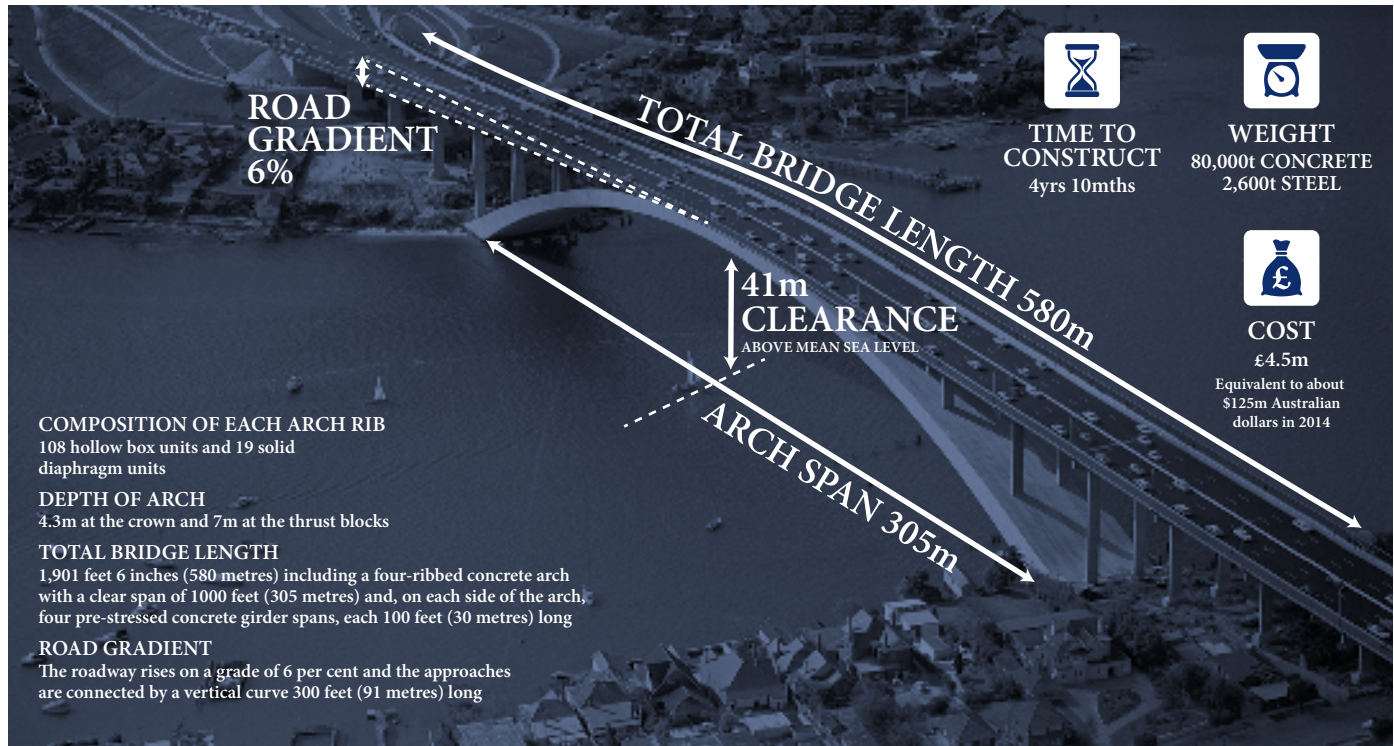
Construction of the bridge was documented by artists, photographers and a film-maker. In 2000 the Roads and Traffic Authority (now Roads and Maritime Services¹) undertook an oral history project to gather the recollections and comments of the engineers and workmen who were involved in the design and construction of the bridge. Selected quotes from the oral history have been used in this book.

“There was a further advantage that up till that time, local consulting engineers had very little experience in bridge design. All the major designs were pretty well done in house in the Bridge Section of the Department of Main Roads, but once Maunsells from the Gladesville era established branches in Australia, other consultants set up and decided that they should also get involved in major bridge designs. The Bridge Section had been a training ground for bridge designers and a lot of these designers then moved out into the consulting field. So Gladesville really started off an era of modern bridge design not only for New South Wales, but it spread throughout Australia.”

Brian Pearson, Former Department of Main Roads
(DMR) Chief Engineer, Bridges

¹ In 1989 the Department of Main Roads, Department of Motor Transport and the Traffic Authority were merged into the Roads and Traffic Authority. In 2011 the Roads and Traffic Authority was merged with NSW Maritime to become Roads and Maritime Services.

KEY STATISTICS



EARLY CROSSINGS

The original Gladesville Bridge built in 1881 was a two-lane, wrought-iron lattice-truss bridge featuring an opening swing span for river traffic. It replaced the Bedlam Point punt which had operated since the 1830s, and was the only vehicular bridge crossing of the river east of Parramatta until the Sydney Harbour Bridge opened in 1932. Until 1949 the old bridge also carried the tram service to Ryde.

The old Gladesville Bridge and the original bridge over Iron Cove were built mainly to shorten the distance to the city from farms and market gardens. Construction of both bridges started in April 1878 but 12 months later work on the Iron Cove Bridge was suspended to allow concentration of effort on Gladesville Bridge, which opened to traffic in 1881.

Following the opening of Iron Cove Bridge in November 1882 and the building of a road linking it to the Gladesville, Glebe Island and Pyrmont Bridges, the time taken to travel from the farms to the city market was shortened considerably.

However, by the 1950s the narrow bridge had become congested by the increasing volume of traffic and a replacement was needed.



The original 1881 2-lane iron lattice truss bridge



Congested traffic on the old bridge (November 1956)



Gladesville Bridge nearing completion; falsework being removed (February 1964)



Artist's impression of the DMR's originally proposed 740-foot steel cantilever truss bridge (1957)



Crane lifting steel reinforcing for crosshead (May 1961)

PLANNING FOR THE NEW BRIDGE

The 1950s and early 1960s baby boom years were periods of rapid post-war growth, optimism and expansion, and planning was underway for an extensive freeway system for greater Sydney. It was an era of major project construction, and many significant Government projects including Warragamba Dam, the Sydney Opera House, the Sydney-Newcastle Expressway and the Snowy Mountains Scheme were under construction during that time.

The new Gladesville Bridge along with Tarban Creek Bridge and Fig Tree Bridge were to form part of the proposed North Western Expressway up the Lane Cove River valley to Wahroonga, where it would join the Sydney-Newcastle Expressway.

RISE OF HERITAGE AWARENESS

Construction of the expressway required the demolition of several historic buildings. The most significant of these was St Malo, a mansion built around 1856 by Didier Joubert, a wine-merchant and Hunters Hill property speculator, who later became the Mayor.

Other impacted buildings were the Police Station, Bank of NSW, Mary Reiby's cottage and the tea rooms overlooking Fig Tree Bridge. The Fig Tree Chapel was dismantled and relocated a short distance away.

The loss of St Malo gave rise to one of the first campaigns for the preservation of a building by the National Trust. Its demolition promoted the rise of heritage awareness and activism in Australia that would in later years influence the form and location of proposed public works and private developments. This activism contributed to the abandonment of the proposed North Western Expressway and other planned expressways in Sydney.

“(Gladesville Bridge) certainly tells us about some very grand visions for Sydney and a very strong point of view that was based on the movement of people and goods by motor vehicle. It tells us about a whole era of post-war planning and the approach to the engineering works that were part of that planning... these works, the Gladesville Bridge, the Fig Tree Bridge and Tarban Creek Bridge, are very emphatic statements on the landscape and they reflect the unquestioning view of the way things should happen. (So the Gladesville Bridge) certainly makes a statement in that way and tells us something about the period and the way things were viewed at that time.”

Tony Prescott, Historian



Fig Tree Chapel (now St Mark's)



St Malo



DESIGN

Anthony Francis Gee received his engineering degree from Cambridge University and joined G Maunsell & Partners in 1956. The gifted 22-year-old was soon given the task of developing the design of a concrete arch for Gladesville Bridge

HORIZONTAL
DEFLECTIONS
OF
QUARTER
POINTS

DESIGN AND TENDERING

In 1957 the Department of Main Roads (DMR) invited tenders for a steel cantilever bridge which had been designed in-house. The United Kingdom firm of Reed and Mallik, in conjunction with Sydney-based firm, Stuart Brothers submitted a proposal for a new bridge designed by G Maunsell & Partners of London – a concrete arch span of 910 feet (277 metres).

The design of the arch bridge was undertaken primarily by Anthony Gee, a 22 year-old engineer who had started work with G Maunsell & Partners in 1956 after receiving his engineering degree from Cambridge University. The gifted young engineer made extensive use of a British Ferranti Pegasus computer, using paper tape input and programs he had written. Gladesville Bridge is now believed to be one of the first examples of a major bridge being designed with the aid of a computer. Tony Gee visited the site during construction and was involved in the jacking of the arch ribs.

The DMR accepted the alternative tender for a 910 foot arch. However, at the instigation of DMR Commissioner H. M. Sherrard it was subsequently modified to 1000 feet (305 metres) and the foundations moved to the shoreline.

This made it the longest concrete arch in the world at that time. The new design also meant the arch would be built on fixed falsework² whereas in the original design, part of the arch was to have been built on floating falsework towed into position.

The final design was checked by both the DMR, Professor J W Roderick and staff of the Civil Engineering Department of the University of Sydney. Professor Roderick also assisted the DMR as a general consultant during the construction of the bridge.

Subsequently, the advice of M Freyssinet of Société Technique pour l'Utilisation de la Précontrainte of Paris was sought on aspects of the design. The Société also acted as consultant with M Guyon and M Jensen onsite to provide advice as each of the four arch ribs were jacked into position.

Associate Professor D Campbell-Allen of the University of Sydney was the consultant on concrete and Associate Professor R L Aston of the University of Sydney was the consultant on the precision surveying during the arch construction.

The inner and outer protective barriers along each footway were designed in accordance with the advice and sketches of Mr D C Maclurcan

of the Sydney firm of architects, Fowell, Mansfield and Maclurcan. Gladesville Bridge is generally acknowledged as the first bridge in NSW to have a specially-designed anti-suicide pedestrian safety railing included in its original design. A feature of the design is that it does not obstruct the expansive harbour views when driving over the bridge.

The consultants, contractors and sub-contractors who were engaged on the design and construction of the bridge are listed at the back of this book.

“It’s a tall railing, about seven or eight foot high, and it has quite a big tube on the top of it which is oval shaped. You can’t really get your hand around it to get a grip on it to climb. And the other advantage is that when you drive over it in a car... the vertical rails become invisible – this horizontal tube is high enough, so that ... you can see the Harbour Bridge and down the Harbour as if there’s nothing there at all. And I think that’s a very good result.”

Ray Wedgwood, historian and former
RTA Chief Bridge Engineer

² Falsework is the temporary structure used to support construction of arched bridges.



GUY ANSON MAUNSELL

(1884-1961)

Guy Anson Maunsell established the firm of G Maunsell & Partners in October 1955. In addition to designing Gladesville Bridge, the firm's notable works in Australia include the Narrows Bridge over the Swan River in Perth (an Engineering Heritage National Marker) and the Tasman Bridge over the Derwent River in Hobart.



ANTHONY FRANCIS GEE

(1934-)

Anthony Francis Gee received his engineering degree from Cambridge University and joined G Maunsell & Partners in 1956. He was the principal designer of Gladesville Bridge, and made extensive use of a computer, writing the computer programs himself. He came to Australia during construction and was involved in jacking of the ribs. He is still a bridge engineering consultant in the United States of America, and kindly contributed some of the material in this book.

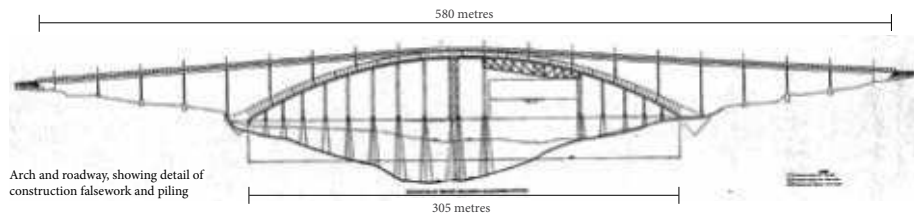


EUGÈNE FREYSSINET

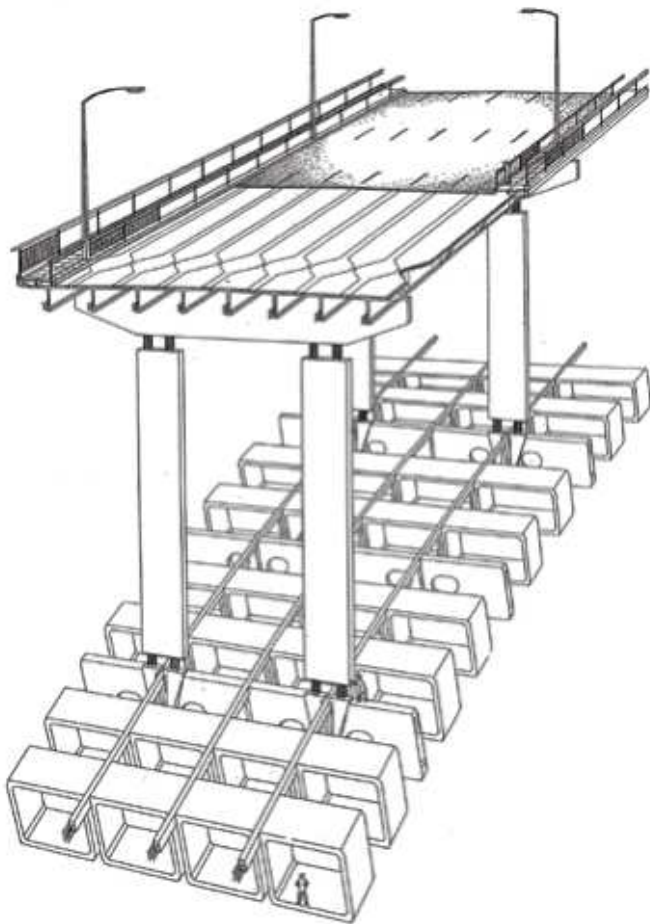
(1879-1962)

Eugène Freyssinet was a French structural and civil engineer who pioneered pre-stressed concrete and the manufacture of high-strength concrete. He also invented the flat jack and pioneered its use in raising arches from falsework.

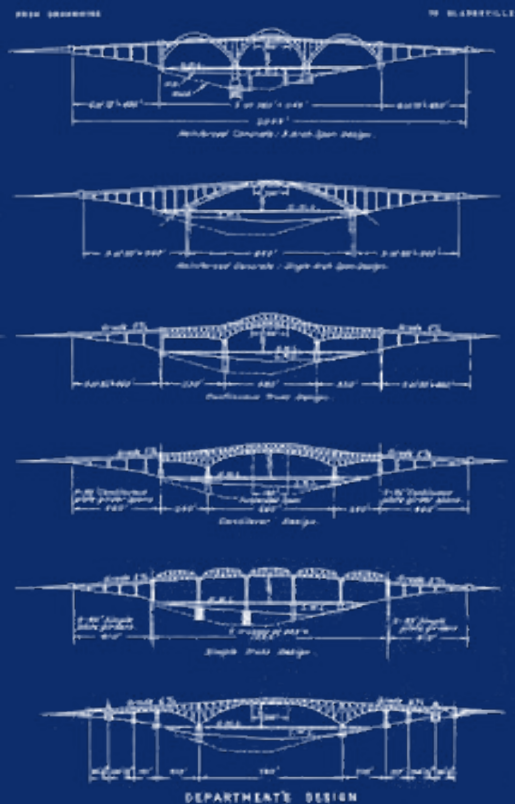
Freyssinet was engaged by the DMR to advise on Maunsell's design for the Gladesville concrete arch.



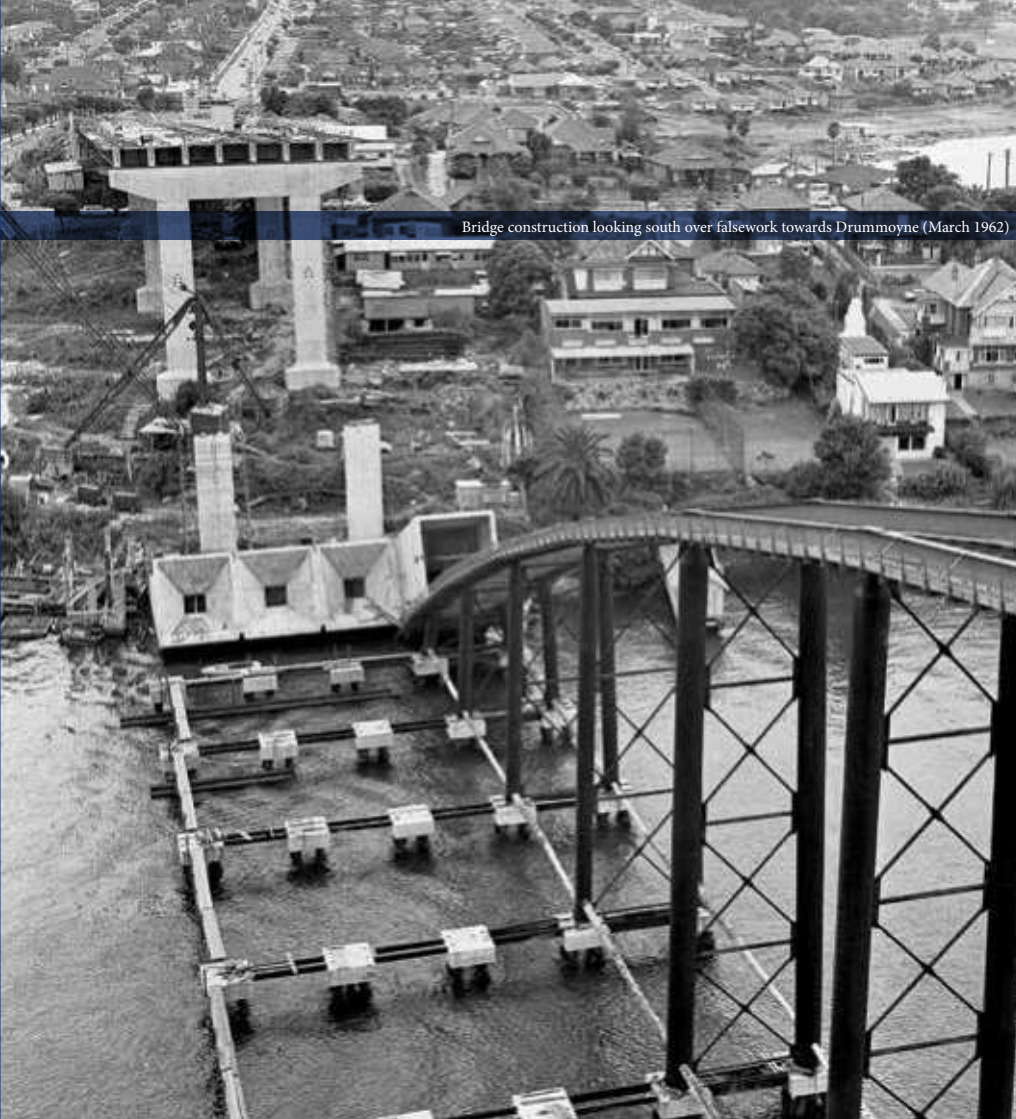
Arch and roadway, showing detail of construction falsework and piling



Schematic of the four arch ribs, the columns and roadway



Alternative designs considered



Bridge construction looking south over falsework towards Drummoyne (March 1962)

DESCRIPTION

Gladesville Bridge is 580 metres long between the northern and southern abutments. It includes a four-ribbed concrete voussoir arch with a span of 305 metres (1,000 feet). Each of the four arch ribs is six metres wide and made up of 19 solid diaphragm units and 108 hollow concrete units, each weighing about 51 tonnes.

The arch is supported by massive concrete thrust blocks, founded deep in sandstone on each side of the river.

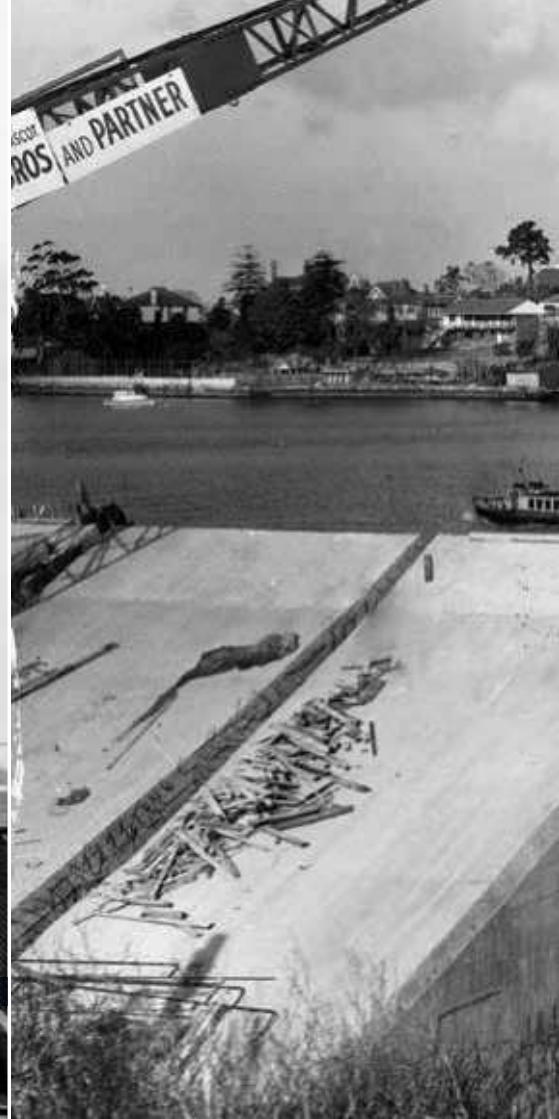
The roadway is formed by prestressed concrete deck beams each 30 metres (100 feet) long carried on pre-stressed concrete columns rising from the arch. The columns have a wall thickness of two feet (0.60 metres) except for the tall columns at the ends where the thickness was increased by six inches (150 millimetres).

The roadway rises on a grade of six per cent from each side of the river and the grades are connected by a 91 metre (300 foot) long vertical curve over the centre of the structure.

The arch has a clearance of not less than 36 metres above water level for a width of 61 metres in the centre of the stream, the maximum clearance at the crown of the arch is 41 metres above water level.



Workers silhouetted inside box section (March 1962)





CONSTRUCTION

CONSTRUCTION OF THE BRIDGE

Foundations

Construction of the bridge started in December 1959 with the cofferdams for the thrust blocks – the arch foundations. About 1,600 cubic metres of earth and 4,900 cubic metres of sandstone were subsequently excavated for the two thrust blocks and for the foundations of the abutments and approach piers of the bridge.

About 11,100 cubic metres of concrete was used in the thrust blocks with the bulk of the concrete having a strength of 41 MPa or 6,000 lbs per square inch. They are of mass concrete and bear on steps cut in the solid sandstone of the river banks.

While the design required that the maximum bearing pressure on the sandstone should not exceed 1.6 MPa (15 tonnes per square foot), testing of rock samples showed that the foundations could support a load eight times greater. This high factor of safety was necessary to ensure against foundation failure and takes into account variations in the quality of the sandstone across the foundation areas.



Concrete pour on the arch foundation, Drummoyne side (November 1960)

Construction of the thrust block on the Gladesville side was completed on 22 August 1961 with the Drummoyne side completed on 30 October 1961.

The abutments at the ends of the bridge deck are of reinforced concrete and of box-type with earth filling. They are founded directly on sandstone.



Completed falsework, showing navigation span (January 1962)



Manual placement of concrete at Huntleys Point coffer dam (February 1960)



Falsework

Falsework was necessary during construction to support the hollow concrete box units and diaphragms which make up the four ribs in the arch.

The 438 supporting piles ranging in length from 10 metres to 50 metres were driven into rock in the riverbed. The falsework consisted of steel tubular columns on steel tubular pile trestles carrying spans of steel beams up to 18 metres (60 feet) long. These high tensile steel beams were rolled by Dorman Long and Co Ltd in the United Kingdom especially for the project and were the first beams rolled in steel of this size and quality. A 93 tonne steel truss span 67 metres (220 feet) long formed an opening for navigation on the Gladesville side of the falsework.

At the centre of the falsework, the steel columns formed a braced tower extending the width of the bridge. The pile trestles had cross members just above water also extending the full width of the bridge.

The rest of the falsework was wide enough to support one rib at a time only. After the first rib was completed, the falsework was moved sideways on rails to support the other three ribs.



Machinery installed on the central tower lifted the concrete box units and diaphragms from barges and moved them into position.

The tower also served as a stay to prevent sideways movement of the individual arch ribs after they became self-supporting and until they were stressed together.

The 150 tonne capacity Titan floating crane, once a prominent feature on Sydney harbour, was used to lift the long steel tubular columns and trusses into position. It was also used to put the columns, headstocks and deck beams for the roadway into place.

Erection of the falsework was completed in November 1961.

Arch components

The concrete units for the arch ribs (108 hollow box units weighing 51 tonnes and 19 solid diaphragm units for each rib) were made at a casting yard set up in the 'Horse Paddock' five kilometres downstream on the Parramatta River at Woolwich. Years before, this site had been used for dressing the granite blocks for the Sydney Harbour Bridge's pylons.

The yard was large enough to allow all units required for one full rib to be laid out and cast,

and used an innovative monorail system to transport concrete around the site. This system was used both at the Woolwich casting yard and at the deck beam and column casting yards at each end of the bridge to deliver concrete from the mixer to the forms.

Each box unit is six metres wide with depths decreasing from seven metres at the thrust block to 4.3 metres at the crown of the arch. The length of the box units along the arch varies from 2.4 metres to 2.8 metres. The diaphragms are solid components, except for an opening to allow subsequent access through the rib, and are generally 0.6 metres thick.

The completed box units were barged to the bridge site and lifted to the crown of the falsework and winched down to their correct positions. The average rate of placement was five to six units per day. The best day was 10 units and the best week was 43 units.

The diaphragms were spaced at intervals of 15 metres to serve the dual purpose of tying the four ribs together transversely and supporting the slender columns that carry the roadway over the arch. When the units had been moved into position on the falsework, the 75 millimetre gap left between them was filled with concrete.

Titan floating crane in use on falsework construction (September 1961)



Aerial photograph showing box units in the Woolwich casting yard and the old and new bridges (January 1963)



Hollow concrete box unit being lowered into position on the falsework (March 1962)



Building the arch

The first box unit was placed on the Drummoyne side of the bridge on 23 February 1962 and on the Gladesville side on 14 March 1962. The last box unit in the first arch rib was placed into position on 31 July 1962.

In September 1962, sets of 224 Freyssinet flat jacks (four layers of 56 jacks) which had been placed at two locations within the arch rib were inflated with oil one layer at a time. The oil was then replaced with grout and allowed to set before the next layer of jacks was inflated. Inflation of the jacks increased the distance between the adjacent units and hence the overall length of the rib along its centre line. This caused it to rise and lift off the falsework making the rib self-supporting. The ribs were jacked to levels above their true funicular shapes by amounts calculated to allow for future creep and shrinkage movements.

The falsework was then moved sideways to carry the components of the next rib and the jacking process was repeated for the second, third and fourth arch ribs by June 1963.

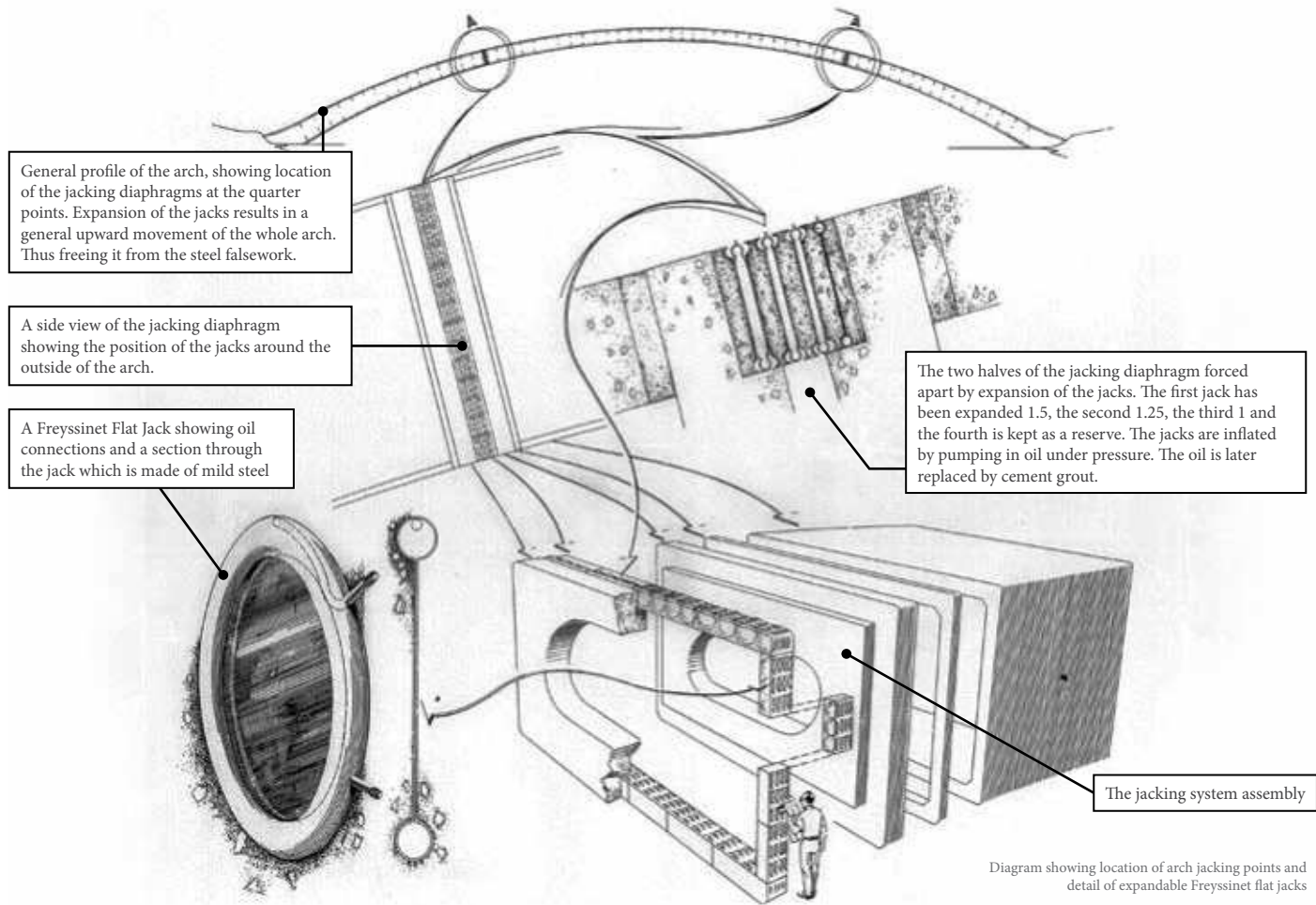
The last box unit was placed in the fourth rib on 31 May 1963.

When the ribs were complete they were stressed together through transverse diaphragms at 15 metre (50 foot) centres.

“It was the biggest arch at that time and the method of lifting one single slender arch at a time off its bearer, seven inches in the middle, just by inflating jacks and the whole thing had to go somewhere, so it lifted up – it was really impressive, the whole thing was incredible. And when they moved the falsework out, here’s this ribbon of concrete, self-supporting across the river.”

Bill Davis, Bridge Worker







Engineers in the jacking control room at the top of the arch inspect jacking control equipment

“This process of expanding these flat jacks and then lifting the arch off the falsework was done midnight to dawn and that was to ensure that everything was at a uniform temperature. Because in the daytime, the sun will be on one side of the Bridge or the other and you can get transverse movement effects. Thinking back now, you’d say it was a quality control process that the little building they built to control all this jacking was actually built on top of the arch. So I guess that concentrated the mind of the people that were engaged in doing the work! They had a good reason to make sure it worked properly.”

Ray Wedgwood, historian and former
RTA Chief Bridge Engineer

Cameramen record progress of construction (September 1962)



Titan floating crane in use erecting deck beams for the roadway

The deck

The pre-stressed concrete columns, which were 0.6 metres (2 feet) thick, and the pre-stressed concrete deck beams were manufactured at casting yards at each end of the bridge. Each pair of columns has a reinforced concrete headstock which supports the deck beams.

The 60 tonne deck beams were lifted by a special launching truss and placed in position on their seatings. There are 143 deck beams in the bridge.

In February 1964 the last deck beams were launched into position to form a continuous base for the six lane road over the longest concrete arch span in the world.

“I think everyone on the Bridge didn’t treat it as just a job. They put their heart and soul into it and there was (sic) some really good workers that made a good finished product because they knew they were building something special.”

Ossie Cruse, Rigger-dogman



Slender piers in place to carry the deck beams (1963)



Workers on headstock during concrete pour (April 1962)

Falsework being removed from completed arch (November 1963)

Completion of work

As the erection of pier columns and deck beams was completed, the concrete deck between the beams and the concrete footway cantilevers were cast in place.

The falsework was then removed from under the arch. Finally, the footways, handrailing and light were installed, and an asphalt-concrete wearing course was laid on the roadway.

At all stages of construction the bridge was meticulously surveyed for accuracy, and its 41 MPa high-strength concrete was tested at a purpose-built on-site testing laboratory.





Placing concrete by hand (March 1964)

THE WORKFORCE

Many of the senior engineers employed on the bridge by the construction contractors were British, while the majority of the site foremen were employees of the DMR. As was typical for major construction projects of the era, many of the labourers were migrants, some of whom also worked on the Snowy Mountains Scheme and the Sydney Opera House. The project also employed several Aboriginal workers, a number of whom filled highly skilled positions including rigger-dogman and crane driver.

The excellent relations between the contractor and the DMR staff and between the workers, supervisors and foremen contributed to a harmonious and enjoyable work experience. An ethic of 'the fair go' was strong at all levels, resulting in very little industrial unrest.

There was no loss of life or serious injury during construction of the bridge. Given the relatively modest safety standards of the era and the 'larrikin spirit' which was occasionally in evidence, this was a tribute to the high quality of on-site supervision and the pride and commitment of the workers.

Work safety rules hadn't been introduced in those days. But work safety, I think, was born into the bridge worker anyway. Not only was he aware that he was working on a structure that was potentially more dangerous than working on a building site, but he was also supervised by people who had been on bridge construction work for most of their working lives and these supervisors, largely the foremen employed by the DMR, insisted that basic safety operations be observed by all the workmen supplied by Stuart Brothers for the project. In fact, I would say that the DMR Bridge foremen trained those Stuart Brothers workmen in basic safety procedures for bridge construction.

Brian Pearson, former DMR Chief Engineer, Bridges





The conditions were good. I think it was because the men themselves saw that you looked after the team. You made sure that if the job wasn't safe, you *made* the conditions safe. You did things yourselves, you didn't have to be told.

Ossie Cruse, Rigger-dogman

We had a policy in the BWIU that was "no work in the rain". And it *was* a dangerous job. You don't work in the rain on that type of structure. And what we did - we were the first ones, I think, to invent the cigarette paper test. Somebody'd pull out a cigarette paper. And it was agreed - after a lot of argument and everything - if it was too wet to roll a cigarette, it was too wet to work. The paper used to get wet, so we'd go inside. When it had eased up a bit, the rep would go out and pull a cigarette paper out and if it didn't get wet, we'd go back to work.

Joe Ward, Bridge Foreman



With that, there was a tremendous mateship, you know, with men working together and I can remember that - that we all worked together and we all looked after each other. You'd have to climb up through the steel - we didn't have safety belts - we'd climb up maybe 120 foot in the air through this steel and we'd all look after each other and look out for each other. And help each other. Make sure that nobody had any accidents.

Ossie Cruse, Rigger-dogman





Workmen hauling steel cable up the arch, accompanied by the worksite dog (August 1963)



Concrete pour for the arch foundation, Drummoyne side (November 1963)



Placing concrete on the deck by hand (March 1964)

TESTING OF MATERIALS

Controlling the quality of the concrete was critically important in the bridge construction. A concrete testing laboratory was established at the bridge site where samples were stored in a 'fog room' under constant temperature and humidity conditions until tested. Testing equipment included a 180 tonne capacity testing machine, a diamond saw, drying oven and mixing unit for investigation of the concrete materials and mixes used in the project.

In addition to continuous day-to-day testing of concrete aggregate, cement and concrete, DMR research staff carried out special long term creep and shrinkage tests of the concrete so that appropriate allowances could be made when the ribs of the arch were placed in compression and freed from the falsework.

Testing of sandstone was also carried out at the laboratory, while testing of steel reinforcement and high tensile steel bar and steel wire strand was undertaken at DMR's Central Testing Laboratory.

COST

The cost of the bridge and its immediate approaches was about £4.5 million, or about \$125 million in 2014 terms.

RECORDING THE CONSTRUCTION

The DMR engaged two artists to sketch and paint the bridge during construction. Landscape artist Rhys Williams (1894-1976), who served as an official war artist during the Second World War, painted three oil paintings of the bridge. Robert Emerson Curtis (1898-1996) who had sketched the Sydney Harbour Bridge's construction and also became an official war artist, prepared 16 pencil sketches of the bridge as it took shape.

Documentary film-maker Kingcroft Productions was engaged to film the bridge's construction. The head of this company was John Kingsford Smith, nephew of famous aviator Sir Charles Kingsford Smith. The four 16 millimetre Kodachrome films have been digitised and are now accessible on Roads and Maritime website at www.rms.nsw.gov.au/gladesvillebridge.

"The bridge was comprised of four separate arches and ultimately each arch had to perform in exactly the same manner... so that the creep and shrinkage properties didn't cause any distortions which were not consistent with the other arches. Bearing in mind that the arch rib members were made over a period of up to 18 months, it meant that everything had to be kept exactly the same throughout the whole of the contract."

Alan Leask, DMR Materials and Research Engineer

"The most important factor was the people. The people on the bridge, whether they were our people or the contractor's people, they all formed part of us and they were all intensely keen and interested in what they were doing and everyone endeavoured to give his best to the project. And that's why it was such a successful project in the long term. It was the people who made it."

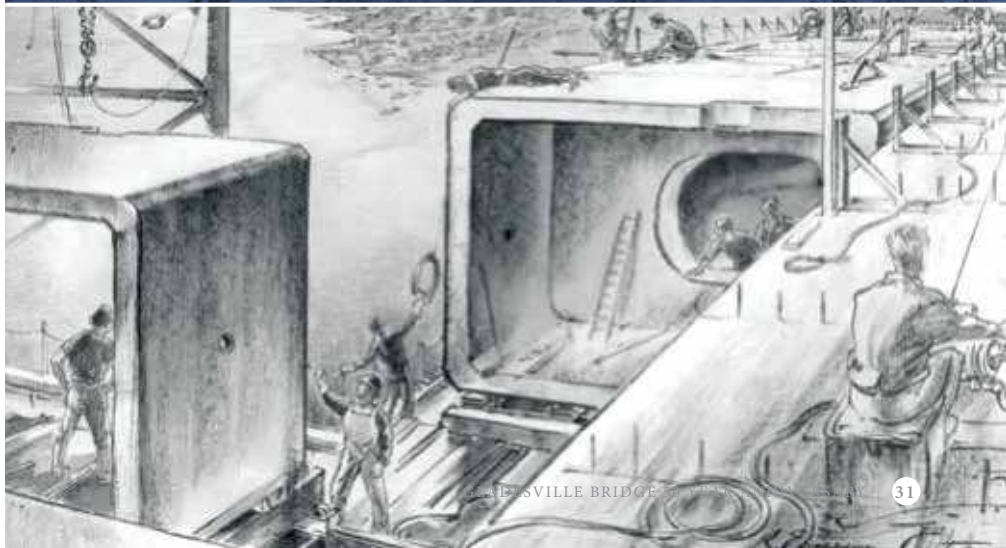
Brian Pearson, Former DMR Chief Engineer, Bridges

The DMR's photographers took hundreds of black and white photographs of the bridge. Many have been scanned and are accessible on the Roads and Maritime website at www.rms.nsw.gov.au/gladesvillebridge.

In 2000, the RTA undertook an oral history project to gather recollections about the construction of Gladesville Bridge. It included recorded interviews with people who were involved in design checking, engineering, surveying, materials testing, filming, labouring, plant operation, site supervision and the opening ceremony for the bridge. Selected quotes have been used in this book, and the complete audio compilation containing the warm and engaging recollections can be accessed on Roads and Maritime website. The unanimous view was that involvement on this project had been a true career highlight.



Pencil sketches by renowned artist Robert Emerson Curtis (1898-1996)





THE GRAND OPENING

THE GRAND OPENING

The bridge was officially opened at 11am on Friday 2 October 1964 by Her Royal Highness Princess Marina Duchess of Kent. NSW Premier J B Renshaw MLA and the Deputy Premier and Minister for Highways P D Hills were in attendance.

About 120 students from the nearby Riverside Girls High School formed a Guard of Honour at the ceremony. At the close of the ceremony the school girls were given an early mark, while the invited guests retired to the school grounds for refreshments.



Students from Riverside Girls High School form a Guard of Honour at the official opening (2 October 1964)

LATER WIDENING

After Gladesville Bridge opened to traffic, travel times to and from the city in peak hours were reduced and queues were eliminated on the approaches. Travel times to the city were reduced by six minutes during morning peak period, and a further reduction of five minutes was achieved with the opening of the nearby Tarban Creek Bridge.

Traffic volumes also increased – while some 38,900 vehicles had crossed the old bridge every day, after a year this had increased to 49,400 vehicles over the new bridge. After two years it had risen to 57,500 vehicles and the bridge is currently carrying around 90,000 vehicles per day.

In response to growing traffic levels in the 1970s, an additional northbound traffic lane was added by reducing the width of the upstream footway by about one metre and slightly narrowing the remaining lanes. The work involved the demolition of the existing kerb and relocation of the median strip.

“On Mondays we always had uniform inspection and in the week leading up to the bridge opening, when the Riverside Senior Girls had been invited to be on the Guard of Honour, I think we had an inspection every day. Every morning at nine o’clock – nails, hair, shoes, everything. The shoes had to shine. Because when royalty was coming, well! It was super important. I think we practised our curtsies for a week before. And our yes Ma’ams – no Ma’ams. We were taught how to address Princess Marina if she were to stop and talk to one of us during her inspection of the Guard of Honour. I remember we were put through our paces every morning leading up to it. It was quite a big deal.”

Christine Akehurst and Lynn Joyce, former
Riverside Girls High School students



Headstone of Bill Reed, principal of construction firm Reed and Mallik, on Norfolk Island

“I’m proud of working on the Gladesville Bridge. I enjoyed every day of it.”

Bill Davis, Leading Hand Bridge Worker

EPILOGUE

Gladesville Bridge had a significant impact on all those involved with its planning, design and construction, none more so than Bill Reed, principal of the bridge’s co-construction firm Reed and Mallik. His headstone on Norfolk Island is a poignant reminder of the powerful effect Gladesville Bridge had on all involved.

KEY CONTRIBUTORS TO THE CONSTRUCTION OF GLADSVILLE BRIDGE

CONTRACTORS

Stuart Brothers builders of Sydney and Reed and Mallik, engineering contractors of Salisbury, England

DESIGN ENGINEERS

Messrs G Maunsell and Partners, consulting engineers of London and Melbourne

DEPARTMENT OF MAIN ROADS CONSULTANTS

Civil Engineering Department, University of Sydney

Société Technique pour l'Utilisation de la Précontrainte, of Paris

Fowell, Mansfield and Maclurcan, architects of Sydney

MAJOR SUB-CONTRACTORS

Ready Mixed Concrete (NSW) Pty Ltd – Establishment of concrete mixing plants and supply of concrete

EPM Concrete (NSW) Pty Ltd – Manufacture of arch jacking blocks, beam end blocks and diaphragms

Sydney Steel Company Pty Ltd, Marrickville – Supply and manufacture of steel falsework

R S Morris & Company Ltd – Placing concrete reinforcement

V H Moy Constructions Pty Ltd – Manufacture of lamp posts

J W Broomhead & Sons Pty Ltd – Manufacture of steel bearings and inner footway protective barrier

Lift Slab of Australia Ltd – Transverse movement of arch falsework

Matthias Engineering Company – Manufacture of outer footway protective barrier

Machine Enterprises Pty Ltd – Excavation for foundations

Hawaiian Australian Concrete Pty Ltd – Manufacture of footway slabs

Prestressed Concrete (Aust.) Pty Ltd – Jacking of arch ribs

Humes Ltd – Manufacture of falsework piles and columns

Sydney Bridge and Wharf Pty Ltd – Driving and extracting falsework piles

Cockatoo Docks & Engineering Co Pty Ltd – Erection of steel falsework and precast concrete columns and headstocks

CONTRACTORS FOR SUBSIDIARY WORKS

Hutcherson Brothers Pty Ltd – Construction of Huntleys Point Overpass

Pearson Bridge Pty Ltd – Construction of footbridge

FORECASTS (for 24 hours from 6 a.m.):
CITY: Fine. Mild. Gaily west to southeast winds. Expected maximum temperature 71 degrees, 8 S.W.; Cool to cold inland, with scattered showers along and tablelands. Fine mid west of coast.

No. 19,161 JONES STREET, SYDNEY Telephone 20544

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The State Government intends to proceed with reallocation of intrastate air routes regardless of the Commonwealth's decision.

It will seek an interim agreement with the Commonwealth, and, if necessary, against Airlines of N.S.W. if the company continues to operate the Sydney-Dubbo service on October 17.

The State Government has set October 12 as the day for the transfer of the Sydney-Dubbo route to East-West Airlines.

Major Political Issue

The Commonwealth announcement is regarded by the State Government as an act of political folly.

They said the Commonwealth action would have a major political impact in the coming Senate elections, and also in the State elections.

The Premier, Mr. Renbush, declined to comment until he had received the official notification of the Commonwealth decision.

He said, however, that it

BOAC Looks At New Air Routes

LONDON, Oct. 2 (A.P. - Reuters) — Sir Colin Gifford, chairman of British Overseas Airways Corporation, told a Press conference today that the corporation is investigating nine new routes, including one to Australia from Britain over the South Pacific.

This particular route, he said, had one of the most exciting prospects, the possibility of flying over the Arctic.

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Also and more British and Australian traffic via New York 1055 Heathrow and BOAC wanted to be on the

● The needs of specific areas.
 ● The convenience and safety of air travel.
 ● The cost to the Commonwealth of aviation facilities.

● Commonwealth subsidies necessary to maintain the viability of this rural air services and
 ● The efficient provision of services to areas open to air.

He said the Commonwealth had the financial responsibility for the provision of all the necessary aviation facilities.

● Continued, P. 6.
 ● Airlines' Comment, Page 6.

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"Hillbilly" Gets £2,000 In Bank Holdup

NEWCASTLE, Friday. — An armed bandit wearing a "hillbilly" hat held up a bank at Ilington today, and escaped with nearly £2,000.

The bandit entered the bank shortly after 11 a.m. and escaped at 1.30 p.m.

The tellers are Robert Keith Brading, 38, of Rivers Street, Newcastle, and Robert Gray Clark, 41, of Dundas Crescent, Charleston.

The holdup took place at 11.30 a.m. and was over in 10 minutes.

When Clark had finished, he returned to his house and found a note pinned to his door.

He then told them to go to the bank, pulled a searchlight out from the back of the car, and left.

Gun Poking From Bag

Wendy Slater, 33, of Chalmers Street, Hamilton, who works near the bank, said she saw a man leaving the bank.

She said: "A man wearing a white-brimmed hat pulled what I thought was a gun, and I saw a flash of light."

Distance runner Alfie Thomas looks on as his daughter Patricia, 12, and Robert, 5, look on as the 10-strong Australian athletics team left Kingsford Smith Airport last night for the Olympic Games in Tokyo (page 21).

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Use of the commonwealth's short-sighted representation, Mr. Allen Davis, whose daughter, Karen, died in Newcastle, told the meeting the cause of death was given to her as severe tuberculosis.

The child was not diagnosed as having the disease until she had been treated for worms, was given vitamin C, and was given a bath.

Mr. Davis said the child had been given a bath in the sea, and had been given a bath in the sea.

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Forecast Of Fine Weather For Long Weekend

The Weather Bureau expects Sydney to have mostly fine weather for the long weekend.

A spokesman for the Bureau said that showers of rain were expected on Sunday and Monday, but that the weather would be mostly fine on Tuesday.

A south-westerly gale was expected to blow from Sunday night, but it was expected to be mostly fine on Monday.

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form its 800 members in 76 countries was to ballot and give it away.

MEMBERS WANTED. The Minister for Supply, Mr. Allen Fairhall, has become a member of the exclusive "Steak Club" while on tour.

To qualify he had to shoot down with a .30-calibre rifle from the cockpit of a plane.

Mr. Fairhall, please have a word with Mr. Chamer.

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Thousands Use New Gladesville Bridge

Thousands of sightseeing motorists yesterday drove across the new \$4.5m Gladesville Bridge — the State's biggest bridge since the Harbour Bridge was built.

The "new" bridge, which cost \$4.5 million, was opened to traffic yesterday at 11 a.m.

The Acting Metropolitan Commissioner of Traffic, Mr. A. J. McCulloch, said last night it was too early to give an assessment of the bridge's contribution to the flow of traffic along Victoria Road.

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On Other Pages

Fighting ships with Indonesian in Sarawak, 10.

Britain, U.S. agree on nuclear restriction treaty, 11.

Handbook on visit Moscow on World tour, 10.

Warfare Festival begins today, 10.

Melbourne police seize Marshall documents, 11.

U.S. plane's epic flight from Australia to South Pole, 10.

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